

Building Nutrient Dense Food.. One Brix at A Time

The Biology Edition

Back to Your Roots Soil Solutions Inc.

Volume 1, Issue 2

May 2011

Free Farm Labour!

- ◆ Free workforce for your farm
- ◆ No wages
- ◆ No housing fees
- ◆ No union or contract issues
- ◆ No WCB claims
- ◆ No safety meetings
- ◆ No paperwork
- ◆ Unlimited workforce, master at recycling, environment management, disease suppression and construction.

Too good to be true ? Read on!

This month Back to Your Roots Soil Solutions Inc. brings to you the wonderful world of soil biology with an emphasis on the importance of microbes in your soil. This issue will explain the Soil Foodweb and the symbiotic relationship between the plant, soil and the many components of the soil foodweb. The soil food web is the community of or-

ganisms living all or part of their lives in the soil. A food web diagram on page four of this newsletter shows a series of conversions (represented by arrows) of energy and nutrients as one organism eats another. All food webs are fueled by the primary producers: the plants, lichens, moss, photosynthetic bacteria, and algae that use the sun's energy to fix carbon

dioxide from the atmosphere. Most other soil organisms get energy and carbon by consuming the organic compounds found in plants, other organisms, and waste by-products. A few bacteria, called chemoautotrophs, get energy from nitrogen, sulfur, or iron compounds rather than carbon compounds or the sun.

As organisms decompose complex materials, or consume other organisms, nutrients are converted from one form to another, and are made available to plants and to other soil organisms. All plants – grass, trees, shrubs, agricultural crops – depend on the foodweb for their nutrition

Miss an issue? They are archived on our website!

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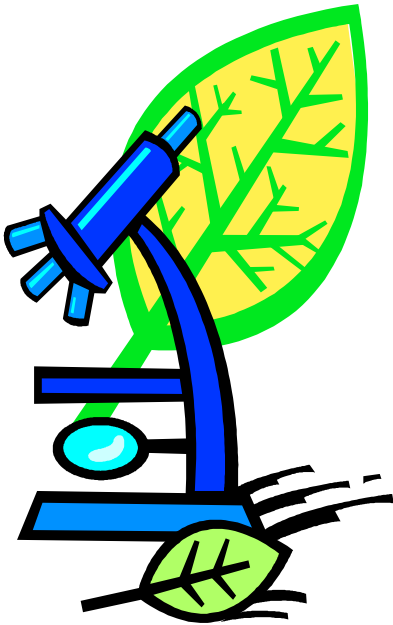
Testing Your Soil Biology

BioDiversity: The More, The Merrier

5 Microorganism Group of the Soil Foodweb

1. Bacteria
2. Fungus
3. Protozoa
4. Nematodes
5. Microarthropods

<http://www.back-to-your-roots.com/sciences/biology.php>



"A SOIL IS NOT A PILE OF DIRT. IT IS A TRANSFORMER, A BODY THAT ORGANIZES RAW MATERIALS INTO TISSUES. THESE ARE THE TISSUES THAT BECOME THE MOTHER TO ALL ORGANIC LIFE".
WILLIAM BRYANT
LOGAN, 1995

Nematodes: Good Guys or Bad Guys?

Nematodes are a group of tiny roundworms that demonstrate the wide diversity and the inextricable food web that exists in a healthy soil. Twenty thousand species have been described, but half a million species may exist. Most soil nematodes eat bacteria, fungi, protozoa, and other nematodes, making them important in nutrient cycling. Others are plant parasites and cause disease symptoms such as malformed or dwarfed plants, or root structures with deformities such as galls and cysts.

The root knot nematode, for instance, stimulates parasitized plants to form root galls. The galls choke off the flow of water and nutrients to the above-ground portion of the plant. Plants infected by

root gall nematodes may live through the season but crop yields will be dramatically reduced.

One way to respond to nematode problems is to rotate crops to remove the nematodes' food source. Another highly effective approach is to build up soil organic matter. The increased organic matter might initially increase nematode populations, but it will also create an explosion of nematode predators such as fungi, mites, and other nematodes.

Fungi prey on nematodes in a number of ways. They trap them with their sticky appendages or squeeze them (like a boa constrictor) in fungal mechanical ring traps. Some fungi exude a toxin to quiet their struggling prey.

(Think of these vicious dramas next time you are riding safely in your tractor cab!)

Some nematodes eat undesirable residents of farm fields. Cut worms, for instance, are hunted down by one species of carnivorous nematode. These nematodes (*N. carpocapsae*) are available from some biological supply catalogues to control cut worms and other crop-damaging underground caterpillars and beetle larva.

Nematodes are not simply pests, but a diverse group of species that play many roles in the soil system.

Full article available at http://www.extension.umn.edu/distribution/cropsystems/components/7403_02.html

BioDiversity: The More, The Merrier



More varieties of microorganisms will make the soil system more stable and resilient. If many organisms perform a similar role, the system is not dependent on just a few for that function. A soil disturbance (such as drought or tillage) might reduce the activity of

some organisms, but in a complex system others will perform the same functions (such as providing ammonium or degrading a particular compound).

Other benefits of complexity may include improved nutrient cycling,

decomposition, and disease control. When many different kinds of organisms are present, many organic compounds and potential pollutants can be degraded, and many competitors and predators are present to control pest populations.

Benefits of Compost Tea

Compost is the best overall soil amendment growers can use to increase the quality and health of soil. Good compost provides soil with nutrients, organic matter, and beneficial microorganisms, which can improve crop health, growth, quality, and yields. Compost also improves a soil's structure and long-term nutrient availability, which helps plants better tolerate drought and suppress disease. However, the time, space, and equipment needed to make and apply compost can make it prohibitive for some farmers. Compost tea offers some of the

benefits of compost in a more manageable package. For centuries, farmers have soaked "tea bags" full of compost in tubs of water, and then used the resulting liquid (compost tea) to fertilize and improve the health of their crops. This type of compost tea, commonly referred to as "passive compost tea", typically uses a ratio of one part compost to five parts water and steeps for about two weeks before it is applied to crops as a soluble nutrient solution. By applying compost tea, you boost the number and diversity of microorganisms in your soil's food web,

making the web more stable and positively affecting your soil's ability to conserve organic matter, retain nutrients and hold moisture. More importantly, all these soil health benefits can translate into plant health benefits, because the most vigorous, disease-free plants usually grow in the most robust "living" soil.

Read the full article at <http://www.scribd.com/doc/35268552/Compost-Tea-Production-Application-and-Benefits-to-fertilize-and-improve-the-health-of-their-crops>



Aerobic Microbial Tea

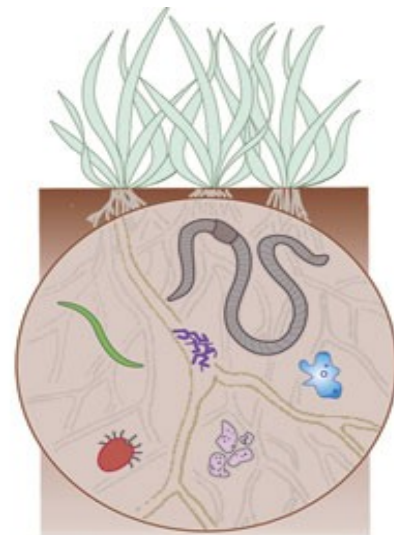
One of the downfalls of compost tea production is the need to keep the solution in an aerobic (oxygenated) state. According to Dr. Elaine Ingham of the Soil Food-

web, anaerobic conditions (below 2 to 4 mg oxygen per L for example) during compost tea brewing can result in the growth of some quite detrimental microbes and production of some very detrimental metabolites. Oxygen in the tea should not fall below 5.5 to 6 ppm dissolved oxygen, which is typically about 70% dissolved oxygen, or 15 to 16% oxygen when measuring total atmospheric gases. Aeration with enough volume to break the surface of

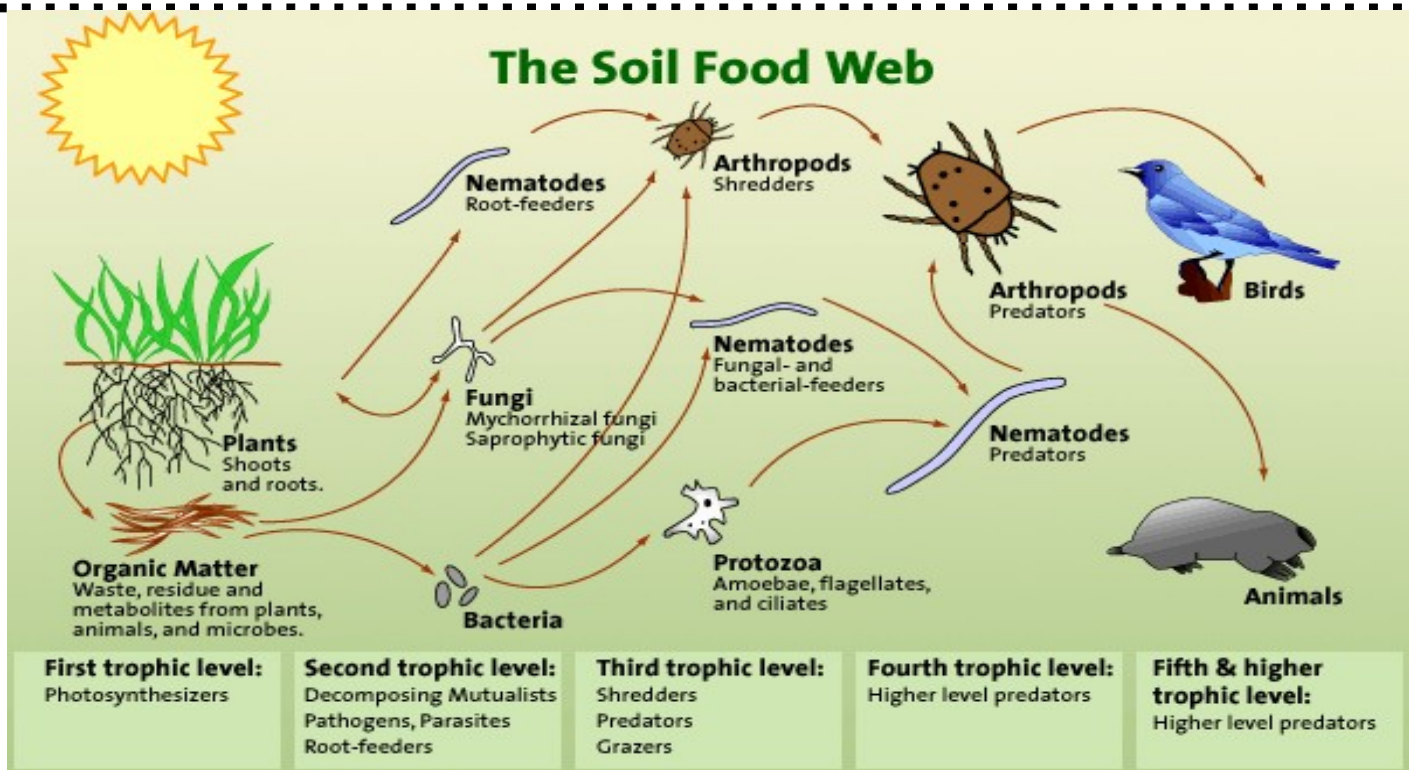
the water is needed to ensure adequate oxygen levels. As the brew starts to multiply its organisms, oxygen needs increase. Regular monitoring of oxygen levels is absolutely vital for ensuring quality microbial tea.

What Does Compost Tea Do? Compost tea can be used to:

1. **Fertilize** crops via soil drenches or foliar applications.
2. **Inoculate** crop residue to facilitate decomposition.
3. **Improve** nutrient cycling in soil through increased microorganism activity.
4. **Manage** certain plant pathogens, to some extent, through microbial competition and improved plant nutrition



What is the Soil Foodweb and why is it so Important?



The soil foodweb is the tonnes of beneficial bacteria, fungi, protozoa and nematodes that live in soil or compost. The value has been overlooked, undervalued and misunderstood for decades. Recent discoveries in soil biology show a huge potential to improve current organic, biological and conventional growing and farming and move away from costly synthetic inputs.

Today, soil ecologists recommend thinking twice before adding ingredients blindly to soil. Instead, we should actively measure what is actually living in the root zone of our crops before adding any-

thing because they have discovered that the plant we see above ground are in a complex symbiosis with microbes in the root zone. It is soil life that provides the 'living bridge' to store and make nutrients in the soil available to plants. It is the protective barrier of friendly fungi and bacteria around the roots of plants that protect plants from disease and crop stress.

Encouraging the growth of life in the soil by creating better habitat and providing proper and adequate foods, sets free currently unused levels of profit-making potential in soil, naturally. Use of chemicals and excessive tillage or poorly composted manures has destroyed this huge potential. This way of growing plants is called soil foodweb health management and

was developed by world-renowned soil micro-ecologist, Dr. Elaine Ingham. She has dedicated her career to help us grow crops better by directly observing and promoting life in the soil.

Soil foodweb management puts back the valuable life in the soil that has been destroyed or is missing. This allows us to move away from costly synthetic inputs that cause so many problems. Commercial growers using the soil foodweb management programs, report substantial savings in crop production input costs, reduced water usage and increases in yield and quality

Testing Your Soil Biology

Soil Foodweb Canada offers two types of soil tests. They have a Soil Biology test based on the Soil Food Web Int. protocols that measure soil biological activity on four soil microorganisms – bacteria, fungi, protozoa and nematodes. They perform assays that determine biomass for bacteria and fungi as well as calculate ratios and rate those populations. They also do water soluble chemistry for macro and micronutrients, pH and EC.

They have submission forms that can be downloaded from our website: www.soilfoodweb.ca. They accept all samples as long as there is some information concerning the sam-

- ple, sampling date and
- what kind of testing to
- perform. They accept
- only soil, compost and
- compost tea. Most of
- their biology samples
- are shipped by courier
- and chemistries are
- dropped off or mailed.
-
- Samples sent for water
- soluble chemistries are
- best sent in the spring
- and fall. Soil biology
- sampling should be
- done in mid to late
- spring preferably once
- the soil has reached a
- minimum of 10°C then
- any time through the
- growing season is ac-
- ceptable. Compost can
- be sent any time the
- compost is active, com-
- post tea is different and

needs to be sent ASAP - although brewers know that and are diligent about sending their tea in.

Soil sampling is important for two reasons – chemistries give some idea of the status of the soil solution and its ability to deliver plant nutrients and whether the soil needs to be supplemented with fertilizers. Soil biology gives an indication of soil health and is an indicator for soil quality. These are important when producers are trying to make some management changes and want to monitor what they are doing to see if the changes have a positive or negative impact on soil nutrients and soil biology.



Common History

- Almost 80% of our atmosphere is comprised of nitrogen.
- Unfortunately, this nitrogen has strong bonds making it very difficult to react with other elements.
- The tremendous energy in lightning can break these bonds allowing some nitrogen to react with oxygen.
- Pre 19th century, nitrogen was returned to fields via animal & human wastes.
- Exhausted fields were left fallow for years or abandoned completely.
- Mid 1800's, Liebig & Lawes develop NPK theory.
- Water soluble South American phosphates/nitrates (salt compounds) spread on fields.
- These phosphates & nitrates diminished or killed the yet undiscovered soil microbes.
- As soil life diminished, chemical dependency ensued.
- The chemical fertility treadmill comes of age.

You Break It-You Buy It

Even as the NPK and Haber-Bosch processes were transforming farming in the late 1800's and early 1900's, other scientists were discovering not only the existence of soil microbes, but also revealing the nitrogen enhancing properties of what were then referred to as animolecules.

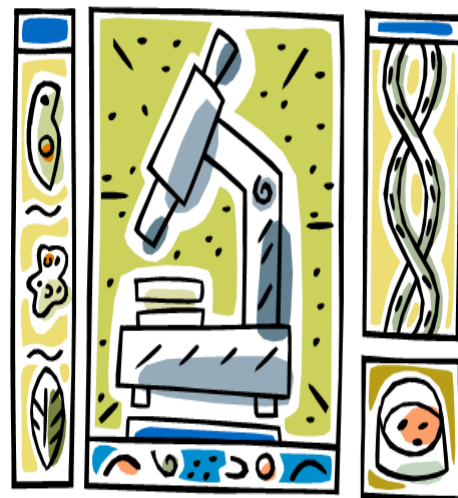
Intuitively and pragmatically, many farmers of thousands of years ago already rec-

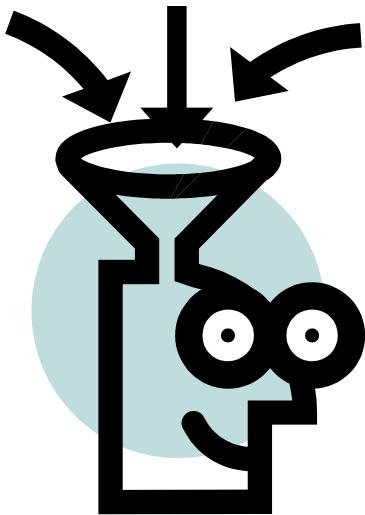
ognized that fertility was enhanced by certain crop rotations. We now know why.

Within healthy soil exists an expansive kingdom of creatures now referred to as the *Soil Food Web*. Internal to this web exists bacteria which live in symbiosis with plant roots. These bacteria harbor an enzyme capable of converting atmospheric nitrogen into plant-usable ammonium.

The actions of nitrogen

fixing bacteria are but one of a multitude of functions occurring within healthy soils - an ecosystem in itself in which billions of bacteria and fungi interact with thousands of protozoa and dozens of nematodes in each handful of soil. With this understanding it becomes apparent that by neglecting your soil biology, minerals, especially nitrogen costs increase dramatically.





Earthworms are the intestines of the soil. -Aristotle

Bacteria are the dark matter of the biological world with 4 million mostly unknown species in a ton of soil]. -Edward O. Wilson

Modern technology
Owes ecology
An apology.
~ Alan M. Eddison

Soil Health Learning Opportunities

Back by popular demand!

Back to Your Roots Soil Solutions will be offering Tailgate Soil Testing Workshops throughout Manitoba and Saskatchewan at various locations from **June 20th until June 30th**.

The workshop is a full day with the morning portion consisting of learning the theory behind producing nu-

trient dense, high brix plants through a power point presentation on soil health and instruction on using the refractometer and EC probe. After lunch workshop participants will head out to the field for hands-on instruction on using soil testing tools, learning about deficiencies in plants and making observations in regards to soil conditions.

The cost of the workshop is \$100.00 and includes workshop, lunch and a VeeGee refractometer (retail value of \$90.00). Please call your local sales rep or head office at 306.747.4744 to reserve your spot

In essence, the science of agronomy is inseparable from biology.

Trofim Lysenko

Our head office in Shellbrook is manned by:

Cindy Nikolaisen, President, Deb Agrey, Market Coordinator, Evelyn Keyowski, Office Manager and Glenda Henry, Customer Care Coordinator. Our office hours are 8am until 4pm from Monday to Friday. Our office is located at 208 2nd Avenue West. If you are in Shellbrook we would love to pour a cup of coffee for you and discuss soil health.

Meet Our Team

In Saskatchewan our sales reps are Roger Puetz, Gary Bertoia, Gillian Thiessen, Chuck Hawkins, Mark & Kara Schiestal and Kevin Henry.

Lorne Muller is the Manitoba Territorial Manager and our sales reps in Manitoba are Ron Catt, John Ness, and Nick Boundy

With literally decades and decades of experience in all aspects of agriculture including organic

and conventional farming, raising livestock, dairy operations and gardening we would love to share our experience and help you grow nutrient dense food one brix at a time.

Our sales reps contact information is available on our website or if you would like to call our Head Office at 306.747.4744 we would be happy to refer you to the closest area representative.



Message from The President

Welcome to our second edition on Soil Health. Biology is one of the sciences involved in growing healthy crops. Often overlooked in place of convenience and time saving, a balanced, diverse biology ecosystem the soil can cost you less and make you more!

Biology in the soil is a very resilient ecosystem, when given a chance. The key is to create an environment that will allow the organisms to flourish.

A good friend and mentor, Glen Rabenburg of Soil Works LLC., uses a similar analogy to explain the need to create an environ-

ment for your biology:

“To create the best workforce known, one would take the smartest individuals, with excellent motivation, energy, creativity, resourcefulness, etc. To this, add a balance of labourers with skills and abilities to all aspects of the work needed to be done. Then address all the needs of the team. Food, uniforms, entertainment and stimulation need to be provided.

Now, once the team is ready, put them on a big ship, sail to the middle of the Arctic ocean and throw the team overboard! Now ask yourself: “How much

work does the team get done?”

Soil biology is similar. If you feed and inoculate your biology, add strains that do specific jobs, super bugs, enzymes, etc. the long term effects are still minimal if you don't create an environment that will sustain their existence.

I encourage you to take a few minutes and read through the articles. Then, ask yourself “What have I done for my biology today”

Play safe out there!

Cindy Nikolaisen



.....
: An agricultural adage says the tiny
: animals that live below the
: surface of a healthy pasture weigh
: more than the cows grazing
: above it. In a catalogue selling
: composting equipment I read
: that two handfuls of healthy soil
: contain more living organisms
: than there are people on the
: earth. What these beings are and
: what they can be doing is difficult
: to even begin to comprehend,
: but it helps to realize that even
: thought they are many,
: they work as one.
: - Carol Williams, *Bringing a
: Garden to Life*, 1998
:

Crop Walks Summer 2011

.....
: **You can't crop check**
: **at 60 MPH through**
: **the windshield of**
: **your truck, you need**
: **to get out in the field**
: **and walk!**
: Again this summer
: Back to Your Roots
: Soil Solutions will be
: conducting local field
: walks throughout Man-
: itoba and Saskatche-
: wan. These walks will
: teach producers how

.....
: to recognize signs and
: symptoms in the soil
: and plants. We will be
: measuring brix, EC
: and compaction using
: various testing tools.
: There is no cost for
: these tours however
: space is limited so
: please call our head
: office at 306.747.4744
: or contact your local
: sales rep to secure a
: spot on this year's

.....
: tour. Tentative dates
: are as follows: July 5th
: through 8th in Manito-
: ba and August 9th
: through 12th in Sas-
: katchewan. Full de-
: tails with dates and
: locations will be avail-
: able on our website at
: www.back-to-your-roots.com
: under the
: upcoming events tab.





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Visit us online at

www.back-to-your-roots.com



Our mission is to provide consumers with access to environmentally friendly products that address soil problems and facilitate sustainable farming practices. With focus on proper soil analysis and evaluation, our goal is to assist producers to identify the underlying causes of the soil problems and develop understanding to correct these problems.

The management of Back to Your Roots Soil Solutions Inc. makes no attempt to portray ourselves or our sales representatives as agronomists. Please use our services and information at your own risk.



To be on our mailing list
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